



Scientists Develop Seismic Hazard Maps to Guide Safe Building Practices in Earthquake Zones

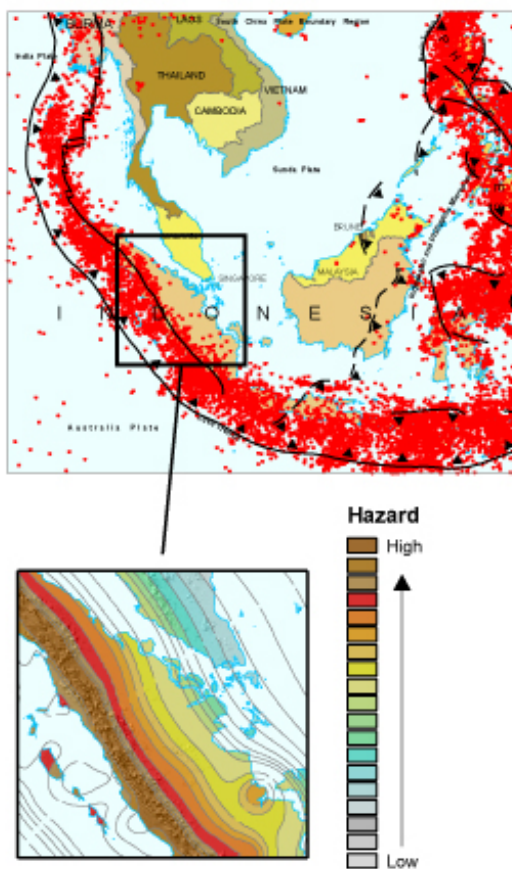


Figure 1: Seismicity map of Southeast Asia and seismic hazard map for a portion of Sumatra, Indonesia showing high hazard along the Sumatra fault and the subduction zone (Petersen and others, 2004).

What is a seismic hazard map and how is it made?

Knowing the location of potential earthquakes is the first line of defense to help save lives and property. Scientists develop maps that clearly show where earthquakes are likely to occur so that communities can use them when designing buildings to make them more earthquake-resistant. These maps are called seismic hazard maps and can be cost-effective tools in construction projects and establishing building codes, since new structures will be designed to resist the ground shaking that typically occurs with earthquakes. Seismic hazard maps are the basis for planning for future earthquakes, informing people of the threat from damaging ground shaking to their homes, schools, work places, and other places they may visit.

Geologists use various tools to identify faults in the earth's crust along which earthquakes have ruptured over the past thousands of years. They estimate the magnitude of the earthquakes and determine how often these earthquakes reoccurred.

Geophysicists then measure the current strain, or pressure, of these faults to understand how the earth is moving. The amount of pressure being exerted on these faults also provides information as to where future earthquakes may occur.

Seismologists monitor and record how much the ground actually shakes from large and moderately-sized earthquakes using an instrument called a seismogram. Analysis of these data provides a basis for understanding how earthquakes of different sizes will shake. Studies of these seismograms indicate that ground-shaking levels are dependent on various factors such as how the fault ruptures and how far the shaking travels along that fault, as well as the depth and characteristics of the soil. Scientists use these data to then develop seismic hazard maps which show the likelihood and location of earthquakes that will cause the ground to shake.



Figure 2-3: Damage from May 2006 Yogya Java

For more information, contact:

Mark Petersen
U.S. Geological Survey
Golden, CO
mpetersen@usgs.gov

<http://earthquake.usgs.gov/hazmaps/>

US IOTWS Program Contacts

Orestes Anastasia

US IOTWS Program Manager
USAID Regional Development Mission/Asia
93/1 Diethelm Towers A, 10th Floor
Bangkok, 10330 Thailand
Tel: +66-2-263-7468
oanastasia@usaid.gov

Dr. Alan White

US IOTWS Program Integrator (Contractor)
Charter Square Building, Unit 1802
152 N. Sathorn Road, Bangrak
Bangkok, 10500 Thailand
Tel: +66-2-637-8518
alan.white@ttemi.com

www.us-iotws.gov

What regions in Southeast Asia are in the greatest danger from future earthquakes?

Recent earthquakes in Indonesia demonstrate the significant threat to urban communities in southeast Asia (Figure 1). While the devastating December 2004 tsunami caused the majority of the damage and loss throughout the Indian Ocean region, there is evidence that significant structural damage in Banda Aceh resulted from the associated strong ground shaking caused by this great earthquake (EERI Special Report, March, 2005). The much smaller magnitude 6.3 Java earthquake (Yogya earthquake) of May 26, 2006 also demonstrates the threat to society from frequent moderate to large earthquakes that occur on the earth's surface, even in the absence of a tsunami (Figure 2-3).

The regions in Southeast Asia that are most susceptible to the strongest ground shaking and resulting damage from an earthquake lie along the zones of seismic activity that encircle the Indian Ocean countries. For example, the Sumatra fault cuts across central Sumatra and has similar physical characteristics and associated ground-shaking hazard as the San Andreas Fault in California that ruptured in repeated damaging earthquakes over the past 200 years. The Sumatra fault and adjacent faults ruptured in 1943 (Magnitude 7.6) and 1892 (Magnitude 7.7). These earthquakes would certainly cause considerable damage if they were to occur today. Scientific studies on the stress changes caused by the 2004 earthquake indicate that the northern extent of the Sumatra fault is likely to rupture at some point. This region has probably not experienced a major earthquake in more than 100 years. Therefore, it is important that this region plan for future strong ground shaking.

How will seismic hazard maps reduce the risk of earthquake damage in Southeast Asia?

The seismic threat to public safety in Southeast Asia is primarily due to the potential rupture of active zones of seismic activity as well as the improper siting and construction of buildings which may collapse in the event of strong ground shaking. Through the USAID-funded US Indian Ocean Tsunami Warning System Program, scientists are developing seismic hazard maps in Thailand and Indonesia. Disaster management specialists in Thailand and Indonesia have all expressed a strong interest to work with the USGS to develop a new generation of ground shaking hazard maps that can be applied to the International Building Code. These ground-shaking hazard maps will form the basis for developing risk reduction strategies that can reduce the damage and casualties from future earthquakes at a reasonable cost to society.

About the US Indian Ocean Tsunami Warning System (IOTWS) Program

The US IOTWS Program is part of the international effort to develop tsunami warning system capabilities in the Indian Ocean following the December 2004 tsunami disaster. The US program adopts an "end-to-end" approach—addressing regional, national, and local aspects of a truly functional warning system—along with multiple other hazards that threaten communities in the region. In partnership with the international community, national governments, and other partners, the US program offers technology transfer, training, and information resources to strengthen the tsunami warning and preparedness capabilities of national and local stakeholders in the region. For more information please visit www.us-iotws.gov.

U.S. Agency for International Development
www.usaid.gov

